3.3 DRBC Integrated List Assessment Methodology

This assessment methodology discusses how the main stem of the Delaware River and the Delaware Bay are broken up into Assessment Units (AU) and how data collected from within those AUs are used to evaluate designated use support. The designated uses that are assessed are Aquatic Life, Recreation (primary and secondary contact), Fish Consumption, Shellfish Consumption, and Drinking Water. This section discusses the general and parameter-specific data requirements for making use support decisions, the method used for defining AUs in the River, the tidal River, and the Bay, the sources of data used for assessments, and the method of assigning AUs to one of five general categories for developing the Integrated List. These categories are defined under "Method For Assigning Assessment Units to Integrated List Categories" below.

3.3.1 General Data Requirements

In order to maintain accuracy and reliability in the assessments used for the Integrated Report and for other environmental decisions and regulatory programs, DRBC ensures that Quality Assurance Project Plans (QAPP) are approved annually prior to the initiation of its routine monitoring programs. Subsequently, any data used for assessment purposes must be accompanied by a QAPP that meets DRBC's requirements for monitoring data. It is assumed that data collected by State and Federal agencies have met the appropriate quality assurance requirements to be used in water quality assessments.

Data submitted to DRBC for use in water quality assessments should be in an electronic format to avoid an undue burden associated with entering large amounts of monitored data into such a format. In particular, data entered into US EPA's STORET system provides an appropriate example upon which to base the formatting of such data. Generally, spreadsheets and databases provide an appropriate format as well.

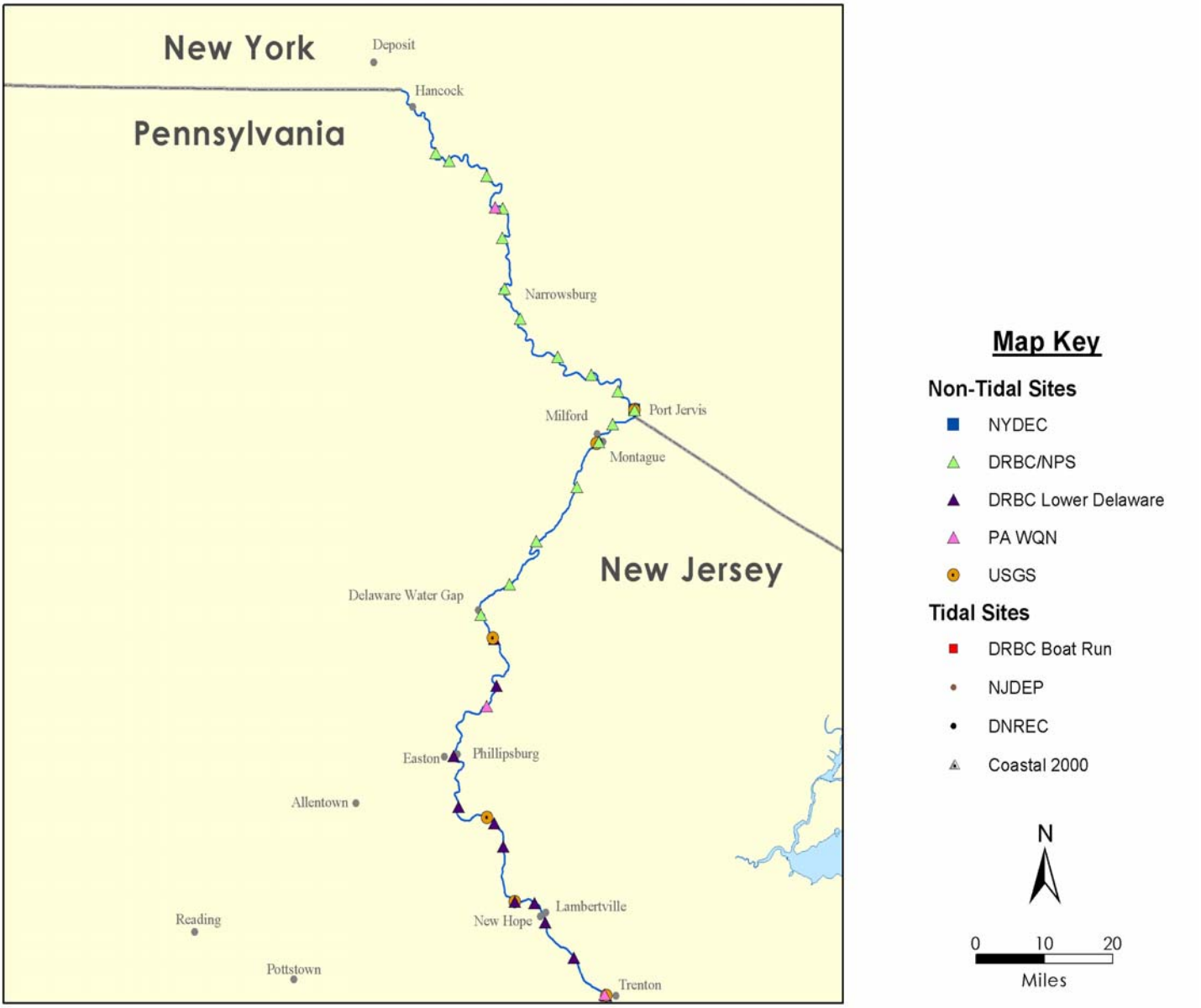
Data and Information Sources

DRBC collects a variety of water quality data from its own monitoring programs and also solicits available data from the Basin States in order to assess water quality in the Delaware River and Bay. The water quality assessments provided in this report are based upon data from the following sources:

- The National Park Service/DRBC Scenic Rivers Monitoring Program (SRMP)
- The Lower Delaware River Monitoring Program (LDMP)
- The Delaware Estuary Boat Run Program
- The Pennsylvania DEP Stream and Wastewater Treatment Plant Water Quality Monitoring
- The Pennsylvania DEP Water Quality Network (WQN)
- The Delaware DNREC Ambient Surface Water Quality Monitoring Program
- The New Jersey DEP Ambient Surface Water Monitoring Network
- The New York State DEC Ambient Monitoring Network
- United States Geological Survey (USGS) National Water Quality Assessment Program (NAWQA) and National Water Information System (NWIS)
- DRBC/USGS Cooperative Monitoring Program (Continuous Monitors)
- Environmental Protection Agency Coastal 2000 Program

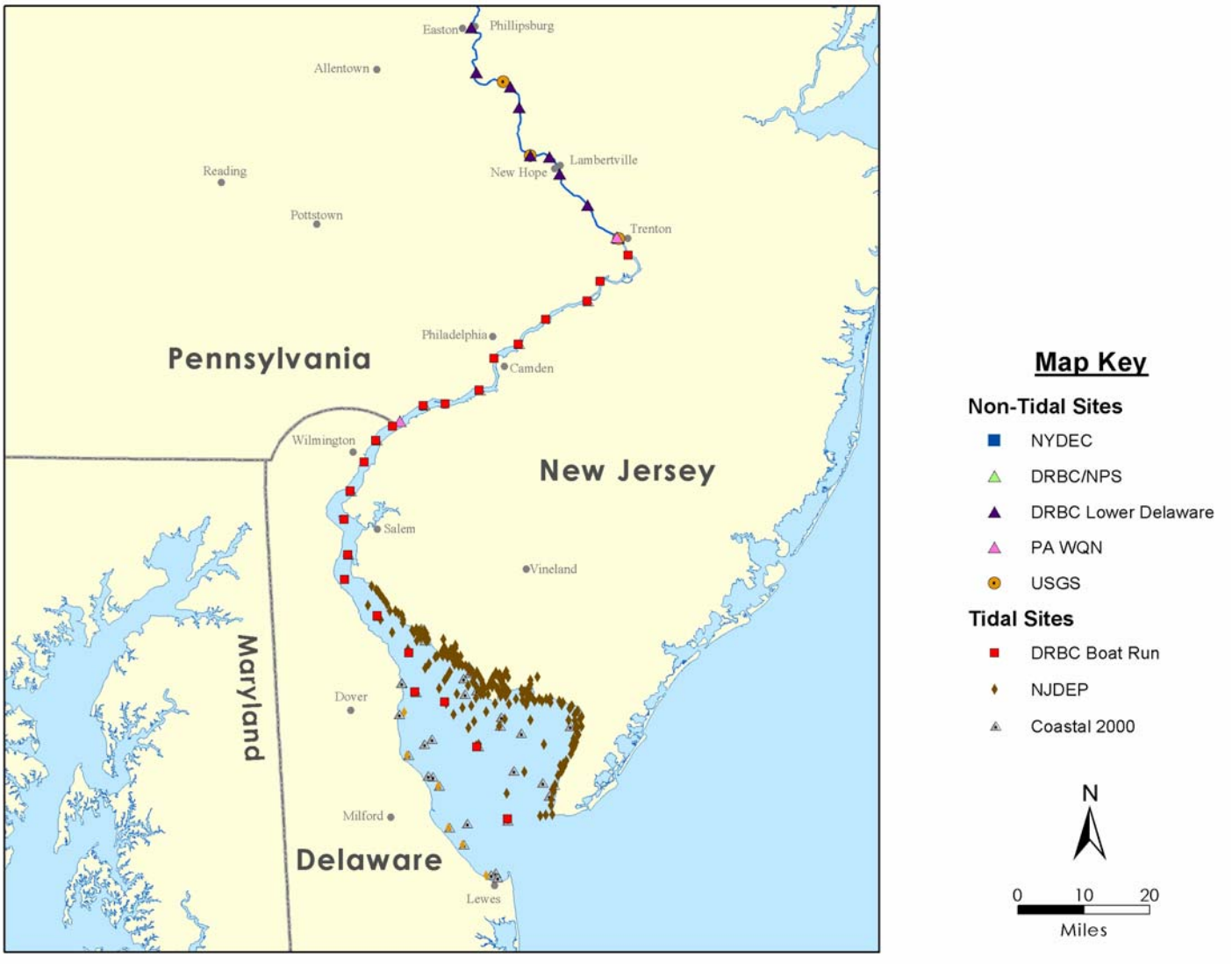
Figures 3.1 & 3.2 show the locations of the sites used in the monitoring programs listed above.

Figure 3.1: Monitoring Locations Non-Tidal



Source: DRBC

Figure 3.2: Monitoring Locations Tidal



Source: DRBC

3.3.2 Coordination with Basin States

Because DRBC's role is to assess shared waters in the Basin (the main stem Delaware River and the tidal portions of its tributaries), coordination with the Basin States is important. The Integrated Listing process defines a list of waters for which Total Maximum Daily Loads (TMDLs) must be prepared (a 303(d) list). However, the regulatory responsibility for preparing a 303(d) list, represented in the Integrated List by category 5, rests with the States. DRBC does not produce a 303(d) list of its own, and thus does not require the public noticing process for publishing a 303(d) list. Further, the programmatic knowledge necessary to sub-categorize waters within Category 4 (what pollution control activities are planned for tributaries to the River, for example) also requires significant input from the states.

In order to avoid potential discrepancies between the DRBC's and States' Integrated Lists, and to ensure that the States have adequate time for their public noticing processes, DRBC provides a preliminary Integrated List to the States in advance of their administrative deadlines to begin the 303(d) list public noticing process. In that way, DRBC and the States have an opportunity to coordinate and come to agreement on any outstanding data or assessment issues, and to arrive at a final list of impaired waters (Categories 4 and 5). Working within this schedule, the most recent monitoring season of data (typically May through October) that DRBC can effectively use for its assessment is the one that occurs two calendar years prior to the April 1 Integrated Report submittal date required by U.S. EPA. The assessment utilizes data from that monitoring season and the two prior monitoring seasons. In the case of this Integrated List report, that includes monitoring seasons in 2000, 2001, and 2002.

3.3.3 Definition of AUs in Main Stem Delaware River, Delaware Estuary and Delaware Bay

Non-Tidal River Assessments

For River assessments (river miles 330.7 to 133.4), the definition of AUs is based upon DRBC Water Quality Zones (Figure 3.3), as specified in its Water Quality Regulations, but also takes into account that water quality in the main stem river is primarily a result of, and may be significantly affected by, tributary inputs. The aggregation of data in a water quality zone for assessment purposes presumes that differences in water quality, among distinct monitoring stations within the zone, are fairly small. However, in the case where a tributary supplies large inputs of one or more pollutants to the River, water quality upstream and downstream of that tributary's confluence with the River may be significantly different, with monitoring stations exhibiting higher water quality upstream of the confluence. Likewise, where a tributary provides higher quality water to a zone, monitoring stations downstream of the confluence may exhibit better water quality than those upstream of the confluence. Aggregating the data within a Water Quality Zone, without regard to this potentiality, may mask locations of either impaired water quality or water quality that is better than criteria. Therefore, AUs have been chosen to reflect the potential for water quality to change due to tributary loadings. The determination of which tributaries should be used to break up existing, programmatically defined water quality zones into more refined, hydrologically-based AUs is based upon capturing those tributaries that supply the majority of the watershed area to the main stem of the Delaware River. Those direct tributaries to the River that comprise 85% of the drainage area (each being roughly 30 square miles or greater in area) have been used to define AUs in the non-tidal portion of the River. The result is a larger, more refined set of AUs that is set up to account for the potential longitudinal changes in water quality that are likely to occur due to tributary influences.

In the relatively less-developed upper portions of the Basin, reservoir releases exert important influences on both flow and water quality in the River. This influence begins at Hancock, NY (River Mile 330.7), where the East and West Branches of the Delaware River converge. Both tributaries are regulated by reservoir releases. The 2004 Assessment focuses on the main stem River, downstream of this location. Within the assessed portion of the main stem Delaware River, those tributaries (from among those used to define AUs, as described above) that contribute reservoir releases are represented by The Lackawaxen River (Lake Waulenpaupack), Mongaup River (Rio Reservoir) and Neversink River (Neversink Reservoir).

Table 3.1 shows the AUs in the non-tidal River that are defined by the tributaries that constitute eighty-five percent of the drainage area of the non-tidal Delaware River. Also shown are the Water Quality Zone boundaries, defined in DRBC's Water Quality Regulations.

Table 3.1: Non-Tidal Assessment Units (Based on Tributary Watershed Area)

Tributary or Boundary	At RM	To RM	Assessment Unit	Tributary or Boundary	At RM	To RM	Assessment Unit
WQ1A	330.7	322.5	1A1	WQ1C/D	217.0	213.0	1D1
Equinunk Ck.	322.5	303.6	1A2	Brodhead Ck.	213.0	207.0	1D2
Callicoon Ck.	303.6	295.6	1A3	Paulins Kill	207.0	197.8	1D3
Calkins Ck.	295.6	289.9	1A4	Pequest R.	197.8	190.7	1D4
WQ1A/B	289.9	285.6	1B1	Martins Ck.	190.7	184.1	1D5
Tenmile R.	285.6	284.22	1B2	Bushkill Ck.	184.1	183.66	1D6
Masthope Ck.	284.22	277.7	1B3	WQ1D/E (Lehigh R.)	183.66	177.4	1E1
Lackawaxen R.	277.7	274.19	1B4	Pohatcong Ck.	177.4	174.6	1E2
Shohola Ck.	274.19	261.84	1B5	Musconetcong R.	174.6	173.7	1E3
Mongaup R.	261.84	254.75	1B6	Cooks Ck.	173.7	157.0	1E4
WQ1B/C	254.75	253.64	1C1	Tohickon Ck.	157.0	133.4	1E5
Neversink R.	253.64	226.9	1C2	WQ1E/WQ2	133.4		
Bush Kill	226.9	225.3	1C3				
Flat Brook	225.3	217.0	1C4				

Figure 3.3: DRBC Water Quality Zones

Source: DRBC

Table 3.2 shows a modification of the AUs in Table 3.1 to account for reservoir releases as described above. Note that this table reflects assessment units, reported to EPA, that are consistent with USGS's National Hydrographic Dataset. This system is slightly different than the DRBC river mileage system (reflected in Table 3.1), upon which its Water Quality Regulations (including water quality zones) are based. These NHD-related assessment units provide the basis for the discussion of assessment results presented in section 3.4 of this report. Figure 3.4 depicts how the river AUs for this water quality assessment are delineated.

Table 3.2: Modification of Non-Tidal Assessment Units (To Factor In Reservoir Release Influences)

Tributary or Boundary	At RM*	To RM*	Assessment Unit	Tributary or Boundary	At RM*	To RM*	Assessment Unit
WQ1A	335.54	308.01	1A1	WQ1C/D	219.35	214.70	1D1
Callicoon Ck.	308.01	299.38	1A2	Brodhead Ck.	214.70	210.20	1D2
Calkins Ck.	299.38	293.62	1A3	Paulins Kill	210.20	200.89	1D3
WQ1A/B	293.62	281.11	1B1	Pequest R.	200.09	192.71	1D4
Lackawaxen R.	281.11	264.88	1B2	Martins Ck.	192.71	185.83	1D5
Mongaup R.	264.88	257.67	1B3	Bushkill Ck.	185.83	185.41	1D6
WQ1B/C	257.67	256.53	1C1	WQ1D/E (Lehigh R.)	185.41	179.02	1E1
Neversink R.	256.53	229.85	1C2	Pohatcong Ck.	179.02	176.16	1E2
Bush Kill	229.85	228.13	1C3	Musconetcong R.	176.16	173.88	1E3
Flat Brook	228.13	219.35	1C4	Cooks Ck.	173.88	156.22	1E4
				Tohickon Ck.	156.22	133.4	1E5
				WQ1E/WQ2	133.4		

* River miles reflect National Hydrographic Dataset mileage system, which differs slightly from DRBC river mileage system.

Figure 3.4: Assessment Units - Nontidal

Source: DRBC

Delaware Estuary Assessments

Table 3.3 indicates the extent of AUs within the Estuary. Assessment units for the tidal waters of the Estuary (river miles 133.4 to 48.2) have been selected on the basis of programmatically defined water quality zones in the DRBC Water Quality Regulations. Due to tidal action in the Estuary, water from the main stem river regularly moves up into the tributaries and water downstream of a tributary's confluence with the River regularly moves upstream of that confluence. While tributary loadings to these zones are an important determinant of water quality, the different hydrology in these zones, as compared to the river zones above river mile 133.4 at Trenton, makes using significant tributaries for the delineation of AUs less effective than in non-tidal river waters. As with AUs in the non-tidal Delaware River, data are aggregated within AUs. See Figure 3.5 for a depiction of AUs in the Estuary.

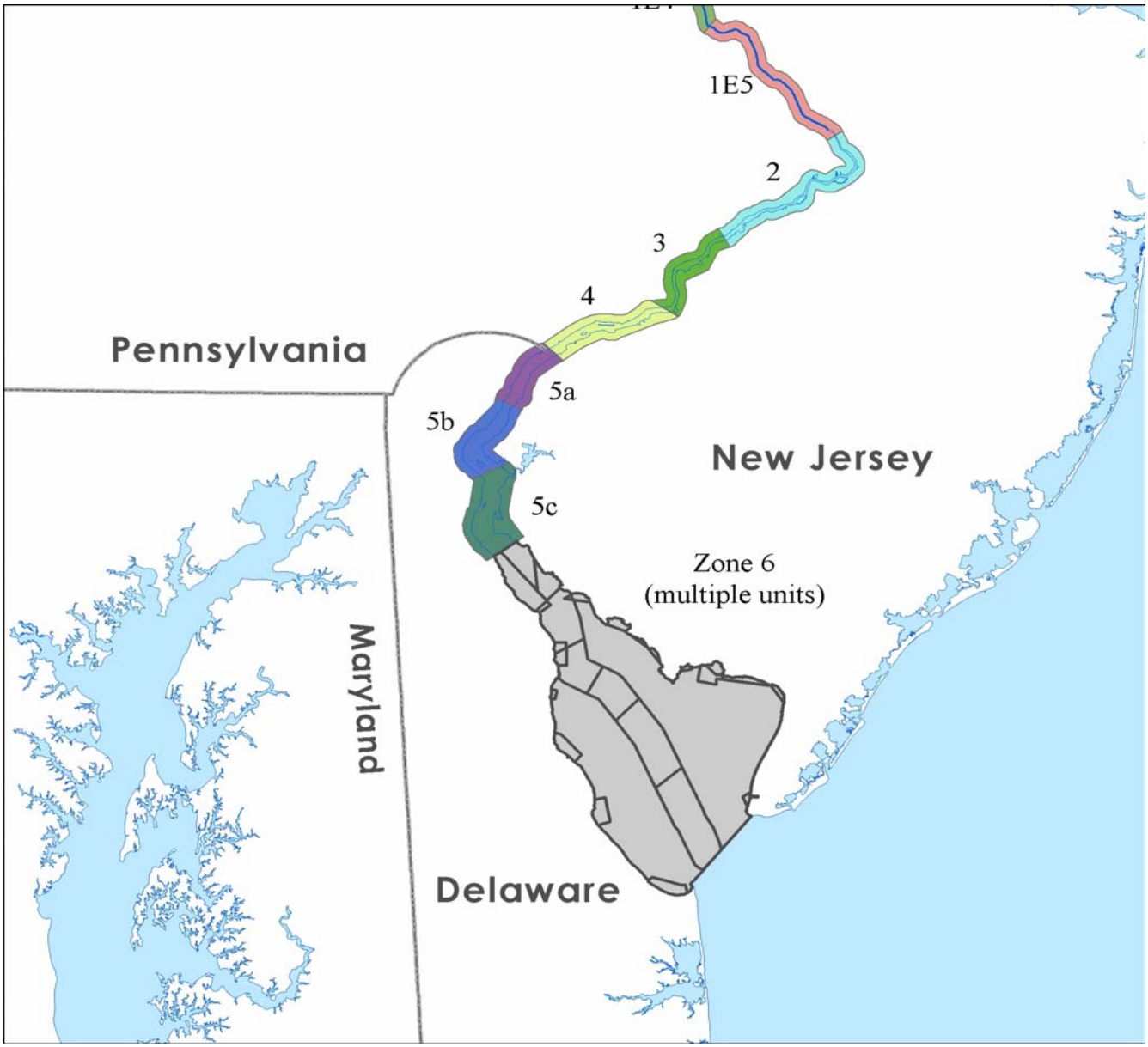
In addition to the AUs based on Water Quality Zones, note that Zone 5 has been subdivided for assessment purposes based upon changes criteria, by river mile, within the Zone itself. The Zone (RM 78.8 – RM 48.2, with an area of 65 square miles) is subdivided into three AUs, based upon changes in the dissolved oxygen criteria within the Zone. The subdivisions are 5A (RM 78.8-RM70.0, with an area of 13 square miles or approximately 20% of the Zone), 5B (RM 70.0-RM59.5, with an area of 21 square miles or approximately 32% of the Zone) and 5C (RM59.5-RM48.2, with an area of 31 square miles or approximately 48% of the Zone). These subdivisions

enable a more effective assessment. Averaging data from a group of sampling locations, for which the water quality criteria differ, could mask issues of non-attainment of those criteria.

Table 3.3: Assessment Units in Tidal River

Programmatic Boundary	At RM	To RM	Area	Assessment Unit
WQ1/WQ2	133.4	108.4	8 sq. miles	2
WQ2/WQ3	108.4	95.0	7 sq. miles	3
WQ3/WQ4	95.0	78.8	17 sq. miles	4
WQ4/WQ5	78.8	70.0	13 sq. miles	5a
	70.0	59.5	21 sq. miles	5b
	59.5	48.2	31 sq. miles	5c

Figure 3.5: Assessment Units - Tidal



Source: DRBC

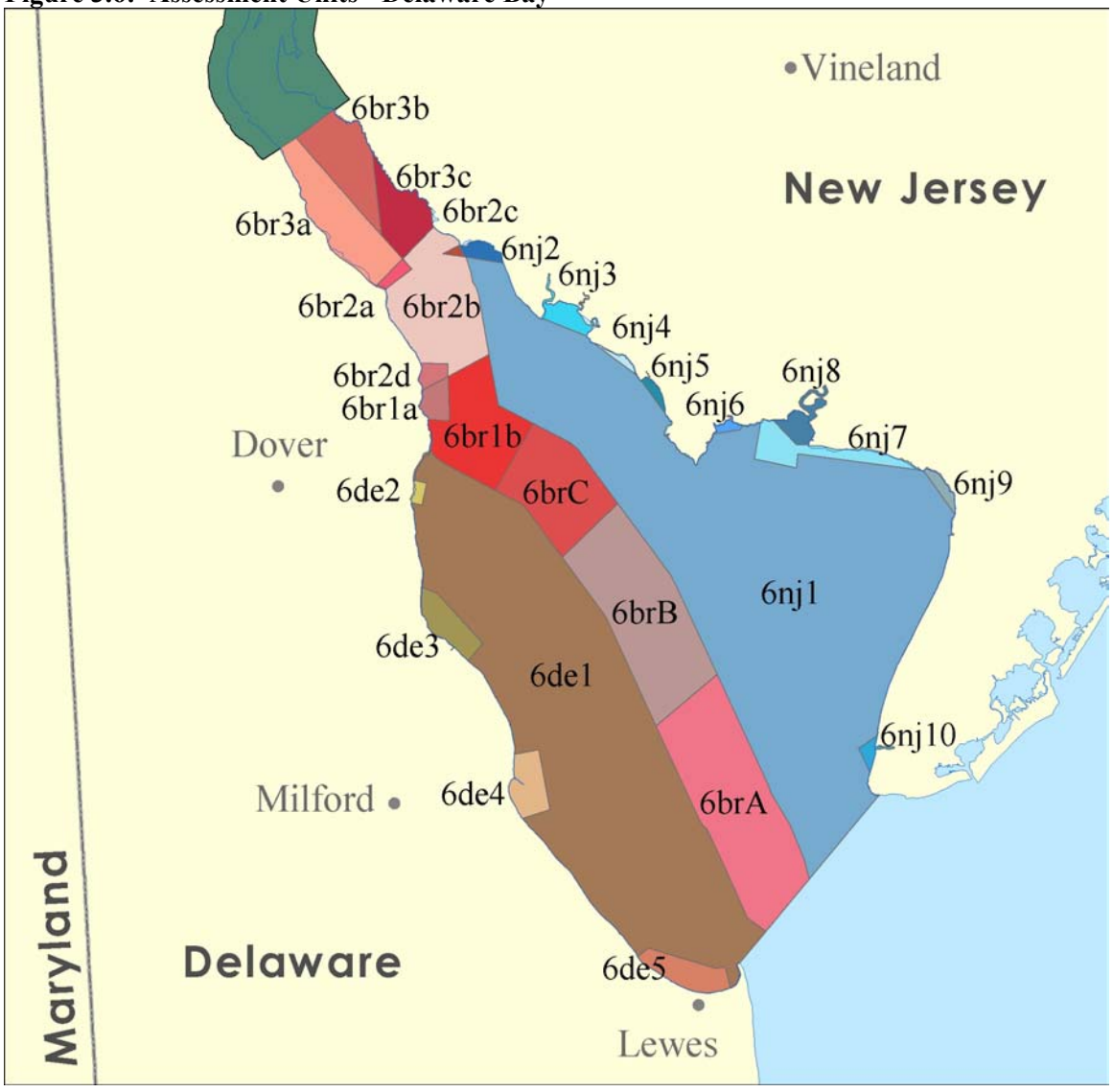
Delaware Bay Assessments

Due to the spatial nature of the Delaware Bay (686 square miles, from River Mile 48.2 to the mouth of the Bay), individual monitoring locations were, for this report, assessed individually and were aggregated by AUs that are based upon areas defined by the shellfish water classifications of the States of Delaware and New Jersey and upon the Delaware Estuary Boat Run program. This method was chosen to remain consistent with water body area boundaries that have already been defined for a particular designated use, namely Shellfish Consumption.

AUs are assessed by looking at the use support or non-support exhibited by the monitoring locations present in those AUs. For example, if all sites in an AU are supporting the Aquatic Life designated use, then the AU is supporting the use. Figure 3.6 shows how the Bay was partitioned into assessment units.

If more than 10% of the assessable sites, where ten or more assessable sites are present in an AU, do not support a use, the AU does not support that use. Where less than 10 assessable sites are present in an AU, all assessable sites must support the use for the AU to support the use. In this second case, non-support of any use will cause the entire AU to be considered impaired for that use, and therefore a Category 4 or 5 water.

Figure 3.6: Assessment Units - Delaware Bay



Source: DRBC

3.3.4 Data Requirements

Tables 3.4-3.6 describe the general criteria for each parameter assessed and how that parameter is assessed relative to DRBC's Water Quality Regulations. The tables also describe the parameter-specific data requirements that are needed to enable assessments that have a higher degree of confidence associated with them. It should be noted, however, that assessments might also be made using data that is less robust than what the Data Requirements indicate.

Aquatic Life

The assessment of the Aquatic Life Designated Use is based upon the monitoring of chemical water quality data. The parameters used for determining use support are dissolved oxygen, temperature, pH, alkalinity, turbidity, total dissolved solids (TDS) and toxics data and information.

Table 3.4: Aquatic Life Designated Use

Parameter	Criterion	Assessment Method	Data Requirements
Dissolved Oxygen	Not less than numerical criterion at any time	Percent of samples in the AU less than criterion	At least 20 samples per AU (or Bay site) over a three-year period
	24-hour average not less than numerical criterion	Percent of 24-hour averages in the AU less than criterion	At least 20 24-hour averages per AU (or Bay site) over a three-year period; 24-hour average requires at least one daytime and one nighttime sample at a site in a 24-hour period, and samples should not be heavily weighted toward daytime or nighttime measurements.
	Seasonal average not less than numerical criterion	Departure (of seasonally relevant sample average) below criterion	In each AU (or Bay site), over a three-year period, at least 20 evenly- distributed (temporally[a]) samples per regulation-defined season.
Temperature	Except in designated heat dissipation areas[b], not to exceed specified increase above ambient temperature. Natural temperatures prevail where ambient temperature exceeds specified level.	Comparison of sampled 24-hour average temperature to date-specific ambient average temperature defined in Water Quality Regulations. Percent of 24-hour averages that exceed criterion.	At least 20 samples[c] per AU (or Bay site) over a three-year period. Samples should be evenly distributed over the calendar year.
pH	Not to depart from specified range	Percent of samples in each AU that depart from specified range	At least 20 samples per AU (or Bay site) over a three-year period
Total Dissolved Solids	Not to exceed 133% of background[d]	In each AU where background is specified in DRBC Water Quality Regulations, percent of samples in AU that exceed 133% of background level	At least 20 samples per AU over a three-year period
Alkalinity	Not less than specified criterion value, or not to depart from specified range.	Percent of samples in each AU less than specified criterion value or outside specified range, as applicable.	At least 20 samples per AU over a three-year period
Turbidity	Unless exceeded by natural conditions, not to exceed maximum 30-day average and not to exceed maximum turbidity criterion	Average turbidity of samples in an AU Percent of samples in an AU that exceed maximum turbidity criterion	At least three samples, on different days, in a 30-day period per AU (or Bay site) At least 20 samples per AU (or Bay site) over a three-year period
Toxics Data and Information[e]	Chronic Toxicity: 1.0 Toxic Units (chronic) Acute Toxicity: 0.3 Toxic Units (acute) Ambient toxic parameters not to exceed criterion	Number of exceedences in an AU over a three-year period	At least 10 samples per AU over a three-year period[f]

[a]Using best professional judgment
[b]See DRBC Water Quality Standards (1996) 4.30.6.F.1
[c]Sample consists of 24-hour average temperature calculated from field measurements within an AU
[d]Criterion not applied below river mile 78.8
[e]Toxics criteria apply between river miles 133.4 and 48.2
[f]Based upon EPA guidelines

Drinking Water

The parameters used for determining the Drinking Water Use are total dissolved solids (TDS), turbidity, chlorides and toxic substances. Because this particular use so closely relates to human health, the assessment takes into account both the ambient chemical monitored data, which provide an indication of the suitability of the source of drinking water, as well as information on actual impacts to the use such as closures of drinking water facilities due to water quality concerns.

Table 3.5: Drinking Water Designated Use

Parameter	Criterion	Assessment Method	Data Requirements
Total Dissolved Solids	Not to exceed 500 mg/l	Percent of samples in an AU that exceed 500 mg/l	At least 20 samples per AU over a three-year period
Turbidity	Unless exceeded by natural conditions, not to exceed maximum 30-day average and not to exceed maximum turbidity criterion	Average turbidity of samples in an AU Percent of samples in an AU that exceed maximum turbidity criterion	At least three samples, on different days, in a 30-day period At least 20 samples per AU over a three-year period
Chlorides	Maximum 30-day average concentration Maximum 15-day average concentration	Average concentration of samples in an AU Percent of samples in an AU that exceed maximum chloride criterion	At least three samples in a 30-day period At least two samples in a 15-day period At least 20 samples per AU over a three-year period
Toxic Substances[a]	Ambient toxic parameters not to exceed criterion	Number of samples in an AU that exceed criterion	At least 10 samples per AU over a three-year period[b]

[a]Toxics criteria, in waters designated for the Drinking Water use, apply between River Miles 133.4 and 95.0
[b]Based upon EPA guidelines

Primary and Secondary Contact Recreation

The parameters used for determining the Primary and Secondary Contact Recreation Uses are fecal coliform and enterococcus bacteria. Note that the criteria call for calculating a geometric mean of bacterial sample results, which, according to EPA's 1997 *Guidelines for Preparation of the Comprehensive State Water Quality Assessments (305(b) Reports) and Electronic Updates*, should include at least five samples in a thirty-day period. However, the monitoring programs in place on the Delaware River rarely use this intensity of bacterial sampling. In that case, for fecal coliform bacteria, the EPA-recommended criterion of 400 colonies/100 ml is used as a single-sample criterion not to be exceeded in ten percent or more of the samples collected in an AU. For enterococcus bacteria, where a geometric mean cannot be adequately calculated, EPA's 1986 guidance document titled "*Ambient Water Quality Criteria for Bacteria*" (EPA 440/5-84-002) to determine the applicable single-sample criterion against which to assess. The applicable criterion must not be exceeded in ten percent or more of samples in order for a given AU to be considered meeting the Recreation Designated Use.

Table 3.6: Primary and Secondary Contact Recreation

Parameter	Primary Contact Criterion	Secondary Contact Criterion	Assessment Method	Data Requirements
Fecal Coliform Bacteria	Geometric Mean Not to Exceed 200/100ml or Instantaneous Maximum of 400/100ml, per EPA guidance[a]	Geometric Mean Not to Exceed 770/100ml	Geometric mean of samples in an AU. Percent of samples in an AU above EPA-recommended instantaneous maximum	At least five samples per AU (or Bay site) over a thirty-day period during each monitoring season. Otherwise, at least 20 samples per AU (or Bay site) over a three-year period.
Enterococcus Bacteria	Geometric Mean Not to Exceed 33/100ml or Instantaneous Maximum of 61/100ml (primary contact freshwater) and 104/100ml (primary contact marine), per EPA guidance[a]	Geometric Mean Not to Exceed 88/100ml or Instantaneous Maximum of 151/100ml (freshwater), per EPA guidance[a]	Geometric Mean of Samples in an AU Percent of samples in an AU above EPA-recommended instantaneous maximum	For Geometric Mean, at least five samples per AU (or Bay site) over a thirty-day period during each monitoring season. Otherwise, at least 20 samples per AU (or Bay site) over a three-year period.

[a] Ambient Water Quality Criteria for Bacteria – 1986 (EPA440/5-84-002), using "infrequently used full body contact" for secondary contact.

Fish Consumption

The categorization of AUs for the Fish Consumption use is based upon the presence of State fish consumption advisories in the main stem or tidal tributary portions of the River at the time of the assessment. Where no fish consumption advisories exist, the water body is supporting the use. Where limits on the number of fish meals or "do not eat" advisories exist for one or more fish species, the water body is impaired for the fish consumption use.

While all state fish consumption advisories aim to provide a high level of protection to the public with regard to the consumption of fish caught from state waters, there may be situations in which two or more states that share a water body do not post the same advisories in that water body. This may be due to a variety of causes, including different approaches to calculating the risks associated with particular contaminants or different assumptions about the amount of contaminant contained in a fish meal. This water quality assessment report categorizes AUs based upon the presence of fish consumption advisories, wherever posted.

In some cases, statewide advisories for one or more fish species may exist for one or more specific contaminants. In some cases, these advisories are based upon the presumption of a high prevalence of that contaminant in state waters, and not upon specific monitored data. Any AUs affected solely by this type of advisory are considered to have insufficient data for an assessment and will be placed in category 3. See the 2004 305(b) water quality assessment reports or Integrated Listing methodologies of Delaware, New Jersey, New York and Pennsylvania for more information about the posting of fish consumption advisories in state waters. The Web pages at the following Internet addresses provide more information:

For Delaware: http://www.dnrec.state.de.us/fw/advisory.htm
For New Jersey: http://www.nj.gov/dep/dsr/njmainfish.htm
For New York: http://www.dec.state.ny.us/website/dfwmr/fish/fishregs/fishhealthadv.html
For Pennsylvania: http://sites.state.pa.us/PA_Exec/Fish_Boat/fishpub/summary/sumconsumption.pdf

Shellfish Consumption

Zone 6 (river mile 48.2 to the mouth of the Delaware Bay) is designated for the Shellfish Consumption use in DRBC's Water Quality Regulations. Both the states of Delaware and New Jersey assess for this use in their coastal waters, using procedures developed by the National Shellfish Sanitation Program (NSSP). In both states, waters classified for shellfishing may be not be open for that use at all times. In some cases, waters are open seasonally (typically in winter). In other cases, harvesting may be prohibited due to administrative closures that are based upon resource protection, upon the proximity of the water to sewer outfalls or upon land uses abutting those coastal waters. In still other cases, waters may be open to harvesting but with special treatment of the shellfish required, such as transplantation to cleaner waters, for a period of time, prior to harvest. Finally, some waters are closed to shellfish harvesting due to existing water quality concerns, as shown by monitoring.

Where sufficient water quality data exist for the States to determine if the Shellfish Consumption use is supported, only those data determine the support of the use. All other waters are considered to have insufficient data. Areas prohibited from harvesting shellfish but not based upon sufficient, recent data, are considered to be Probably Not Supporting the use. Areas that are open to harvesting or seasonally open to harvesting are considered to be Probably Supporting the use. This does not necessarily mean that collecting more data would enable those areas to be reclassified, as many of the areas are classified based upon agreements or precautions.

3.3.5 Method For Assigning Assessment Units to Integrated List Categories

When an AU is assessed against the relevant criteria for determining if all designated uses have been met, that water body is then placed into one of five categories that describe both the level of use support and the degree to which the available data can be used to accurately assess use support. The five categories into which an AU can be placed are as follows, according to the 2004 Integrated List Guidance provided by U.S. EPA:

Integrated Listing Categories (2004 Integrated List Guidance)

1: Water body is attaining the water quality standard and no use is threatened
2: Water body is attaining some of the designated uses; no use is threatened; and insufficient or no data and information are available to determine if the remaining uses are attained or threatened
3: Insufficient or no data and information to determine if any designated use is attained
4: Impaired or threatened for one or more designated uses but does not require the development of a TMDL
   A. TMDL has been completed
   B. Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future
   C. Impairment is not caused by a pollutant
5: The water quality standard is not attained. The AU is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL.

Tables 3.7-3.10 below explain, for each of the various designated uses assessed, how an AU is considered to be supporting that use. Table 3.11 explains how an AU is assigned to Categories 2-5. Note that, for Bay assessments, each site is assessed individually for support of each use and then all sites in an AU are evaluated in concert to determine the final assessment category into which that AU should be placed.

Table 3.7: Aquatic Life Designated Use – Supporting

Category	Parameter	Explanation
1	Dissolved Oxygen	• Data requirements met for at least half the applicable component criteria. • Less than 10% of samples in AU (or Bay site) violate "not less than" criterion. • Less than 10% of 24-hour averages in AU (or Bay site) violate "24-hour average" criterion. • No seasonal average violates "seasonal average" criterion.
	Temperature	Data requirements met. Less than 10% of samples in AU (or Bay site) violate criterion
	pH	Data requirements met. Less than 10% of samples in AU (or Bay site) violate criterion
	Total Dissolved Solids	Data requirements met. Less than 10% of samples in AU violate criterion
	Alkalinity	Data requirements met. Less than 10% of samples in AU violate criterion
	Toxics Data or Information	Data requirements met. For each parameter assessed, no more than one exceedence each of acute and chronic toxicity criteria over a three-year period. No more than one exceedence of ambient parameter criteria over a three-year period.
	Turbidity	• Data Requirements met • No more than one 30-day average exceeds maximum level criterion per year • Less than 10% of all samples in an AU (or Bay site) exceed maximum level criterion over the three-year assessment period

Table 3.8: Primary and Secondary Contact Recreation Use – Supporting

Category	Parameter	Explanation
1	Fecal Coliform or Enterococcus Bacteria	• Data requirements met. • In a given AU (or Bay site), no violations of the geometric mean criterion exist for any 30-day period in which at least five samples have been collected. • The results of less than 10% of samples in an AU (or Bay site) exceed the relevant criterion over a three-year period.

Table 3.9: Fish Consumption Use – Supporting

Category	Parameter	Explanation
1	Fish Consumption Advisories	In a given AU, no fish consumption advisories are present that are based upon monitored water quality or fish tissue data or other water body-specific information.

Table 3.10: Drinking Water Use – Supporting

Category	Parameter	Explanation
1	Drinking Water Supply Closures	In a given AU, no waters affected by administrative closures for drinking water supply, due to water quality concerns, over the three-year assessment period
	Chlorides	• Data Requirements met • No more than one 30-day or 15-day average (as applicable) exceeds maximum level criterion over the three-year assessment period • Less than 10% of all samples in an AU exceed maximum level criterion over the three-year assessment period
	Turbidity	• Data Requirements met • No more than one 30-day average exceeds maximum level criterion per year • Less than 10% of all samples in an AU exceed maximum level criterion over the three-year assessment period
	Total Dissolved Solids	• Data Requirements met • Less than 10% of all samples in an AU exceed maximum level criterion over the three-year assessment period
	Toxic Substances	• Data Requirements met • For each parameter assessed, no more than one exceedence of criteria over the three-year assessment period

Table 3.11: Explanation of AU Assignment to Categories 2-5

Category	Explanation
2	• Data requirements met for assessing at least one but not all uses. • No parameters for which data requirements are met indicate nonattainment of criteria. • AU is "probably supporting"[a] one or more uses and is supporting all other uses. • No parameters, for which Data Requirements are not met, indicate a high likelihood of criteria nonattainment. [b]
3	• No designated use has sufficient data for all its relevant parameters. • In the case of Fish Consumption, AUs affected by statewide or other advisories that are based upon the presumption of contaminant presence, but not based upon water quality data, are listed in this category. • In the case of Shellfish Consumption, areas affected by administrative or precautionary closures, and for which water quality data are not sufficient to determine the presence or absence of water quality concerns relating to this use, are listed in this category.
3A Waters of Concern	• One or more parameters, for which insufficient data exist, indicate a high likelihood of impairment[b] • AU is "probably not supporting" one or more designated uses[a]
3B	• AU is "probably supporting" one or more designated uses[a]. There is insufficient data to determine if the remaining uses (if any) are supported. No uses are "probably not supported".
4	• One or more water quality criteria not met, additional data or information indicate a likelihood of one or more water quality criteria not being met by the next reporting cycle. • In the case of Drinking Water use, AU is has been affected by an administrative closure due to monitored water quality data. • A TMDL is not required due to 4A, 4B or 4C.
4A	TMDL has been completed
4B	Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future
4C	Impairment is not caused by a pollutant
5	• One or more water quality criteria not met, additional data or information indicate a likelihood of one or more water quality criteria not being met by the next reporting cycle. • In the case of Drinking Water, AU has been affected by an administrative closure due to monitored water quality data during the three-year assessment period. • In the case of Fish Consumption, AU is affected by a fish consumption advisory for one or more species, based upon monitored water quality or fish tissue data. • In the case of Shellfish Consumption, area is affected by a shellfishing restriction or closure based upon recent monitored water quality or shellfish tissue data.

a*:* AU, for which insufficient data exist to assess a given use, is bounded by two AUs that have sufficient data for assessment. See below.
b: Twenty-five percent or more of samples in an AU exceed the criterion or seasonal average exceeds criterion by 25 percent or more of the criterion value. See below.

Use of Continuously Monitored Data

Data on temperature, dissolved oxygen and pH are collected continuously at a number of locations on the Delaware River. These data represent the most accurate reflection of water quality at those locations, given that all three of those parameters normally exhibit diurnal fluctuations that cannot be captured by once-daily monitoring. Continuously monitored dissolved oxygen, for instance, provides a reliable twenty-four hour average that can be used to assess that component of the DRBC water quality criteria for dissolved oxygen. In AUs where continuous data exist for temperature, dissolved oxygen and/or pH, those data are used to represent water quality conditions, for those parameters, in that AU.

Waters of Concern

The Data Requirements presented in Tables 3.4-3.6 are goals and are not used to preclude a water body from being assessed. For example, where one or more parameters, for which the data requirements have not been met, indicate that an AU exhibits a high likelihood of criteria non-attainment, the AU will be placed in Sub-Category 3 as a "Water of Concern". A high likelihood of non-attainment is considered to be:

- 25 percent or more samples not meeting the criterion for a particular parameter
- A seasonal average that does not meet the relevant criterion by at least 25 percent of the value of the criterion

Assessment Units Probably Supporting or Not Supporting a Designated Use Based Upon Adjacent Units

Where an AU, for which there are no or insufficient data for determining its support of a particular designated use, is bounded by two AUs supporting that designated use, the unit with no or insufficient data is considered to be *probably* supporting the designated use. Likewise, if bounded by AUs that are impaired for a particular use, then the unit with no or insufficient data is considered to be *probably not* supporting the use. An AU that is probably supporting one or more uses and is supporting all other uses is placed in Category 2. An AU that is probably not supporting one or more uses, but is not impaired for any use, is placed in Category 3 as a "water of concern".

If an AU, for which there are no data on a particular use, is bounded by two AUs that differ in their support for that use, then the use is considered to have no supporting information and the AU will be placed in the appropriate category, depending on the support level of the remaining uses:

- Category 2 if at least one use is supported and all other uses are supported or have insufficient data or information, with no uses "probably not supported".
- Category 3 if no uses have sufficient data or information for assessment and no uses are either Probably Supported or Probably Not Supported
- Category 3A (Waters of Concern) if any parameters indicate a high likelihood of impairment (see above) or if any uses are Probably Not Supported
- Category 3B (Probably Supporting one or more uses) if one or more uses is Probably Supported but there are insufficient or no data or information on the other uses and no uses are "probably not supported"
- Category 4 or 5 if one or more other uses are impaired based upon sufficient data for assessment.

Insufficient Data to Assess Criteria Based on 30-Day Averages or Geometric Means

Where less than three samples are collected in a 30-day period (for 30-day averages) or, in the case of bacteria, less than five samples are collected in a 30-day period (for geometric mean), the percent of all samples collected in the AU that exceed the numeric criterion will be used. In the case of fecal coliform bacteria, the EPA-recommended 400 colonies per 100 ml will be used as a single-sample criterion not to be exceeded ten percent of the time or more. Similarly, for Enterococcus, the EPA-recommended method (Guidance Document EPA440/5-84-002, January 1986) is used to determine single sample criteria. If there are less than 20 samples for a parameter in the three-year period assessed, then the AU has insufficient data for that parameter.

Multi-Component Criteria

Some parameters have two or more component criteria, as with the "not-less-than", "24-hour average", and "seasonal average" components of the Dissolved Oxygen criteria. If at least one-half of the components can be assessed with sufficient data, then the parameter can be assessed, using the results of the assessed components. If less than one-half the components have sufficient data for assessment, then the parameter is considered to have insufficient data for assessment.

Assessing Data from Different Sources

All assessed data within an AU are considered to carry equal importance and relevance, as all sources of data used for an assessment must have been collected, analyzed and documented using the appropriate, recognized state and/or EPA quality assurance and control procedures. Therefore, data that come from different sources are assessed in aggregate by AU.